



<SHAMELESS PLUG> This little read is from my collection at www.cwoodcock.co.uk entitled *Narratives of the Unanticipated*. Get it? If you've got a short, preferably humorous tale that could fill two future pages of ZXF, feel free to send it in. We do do other things, after all. Don't we? </PLUG>

Crash

I was in a plane crash. You might remember the incident. A guy three rows in front of me, whilst tucking into his second helping of crackers and Dairylie, found his way into the cockpit's website on his laptop and uploaded a distracting e-mail to the pilot. The Captain made a short announcement in which he asked us to remain in our seats - it made identifying the bodies so much easier - and thanked us for flying with Air Burgundy. As we plummeted helplessly to our deaths my mind darted back to the ubiquitous safety instructions and cross referenced them with the scenic map provided in every complimentary copy of "The safest way to travel!" in-flight magazine. Our situation was hopeless. We needed water to land in and the nearest to our position was a small pond in the tiny village of Drieselkopf, home of laderhosen and the German burp. So I reasoned thus: by staying in the plane I could be killed by the buckling fuselage, exploding fuel and any number of other factors - even the obese market researcher in the window seat beside me was a potential threat; but by leaving the plane and taking my chances outside, only the ground could get me. So I took my leave of my fellow passengers and threw myself into the whistling air.

A mountain broke my fall. Its uniquely parabolic incline slowed my terminal velocity to a gentle roll, and I came to rest in a daisy-covered field before a quietly grazing cow. Buttercup - for that was her name - took a liking to me instantly and set about licking off the grass stains from my Bopplefield waistcoat that were the only

outward signs of my hasty descent. And so, presentable again, I made my way into a small village to seek its elders and my way back home to our glorious realm.

Dwietzgein Finklepompen, mayor for the third year running of this alpine abode, greeted me in his luxurious chambers of oak, leather and expertly crafted formica. He was a round-faced man with a belly as wobbly as jelly and a nose as red as a tulip. With a glass of home made Fochenbeiner and a thick slice of Buttercup pie (it had been her last day in the meadow) he welcomed me to his village and congratulated me on my survival. "My friend," he said, "your presence here is not without its complications. My people have lived here in this valley for centuries, undisturbed by the outside world's influence. In fact, you are the first person from yonder ever to stumble across our very existence since B F Skinner in 1959. Many, many years ago our ancestors discovered that if no roads lead to a place then no-one ever visits it. Keen to establish a harmonious paradise where they could make their sausages in peace, they founded our brave new community up here, where no road would reach us. We lead a simple life: our women keep our homes clean and hunt for us in the forest; our children play happily in the fields to keep the livestock entertained; our men, of course, work daily on the problems of quantum physics - we have our own website accessible only through the key words chicken, Jehovah and Street Hawk. You are in Eden and you must stay; we cannot let you leave our home alive."

Wholeheartedly, I assured the mayor I had no



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Important! This is a *trial issue*. I've thoroughly enjoyed myself producing this little bundle of pages and I'm more than happy to keep on doing this into the future; I'm not going to, however, if nobody likes it. If you enjoy **ZXF** and you want it to continue then consider yourself duty bound to let me know this (mail@cwoodcock.co.uk). All other feedback will be gratefully received also - criticisms (please be kind), improvement suggestions and notifications of any errors you think you've spotted are essential for this sort of project to succeed.

This issue has been entirely put together by me. It was great fun, however it's not a level of input I anticipate being easy to maintain in the future. If you would like to contribute to future issues of ZXF - even if it's just to write a letter - **please do**; contact me again by the email address above.

Editor: Colin Woodcock

Thanks to: Garry Lancaster, Chris Cowley, Jeff Braine, Cliff Lawson, John King and Thomas Eberle.

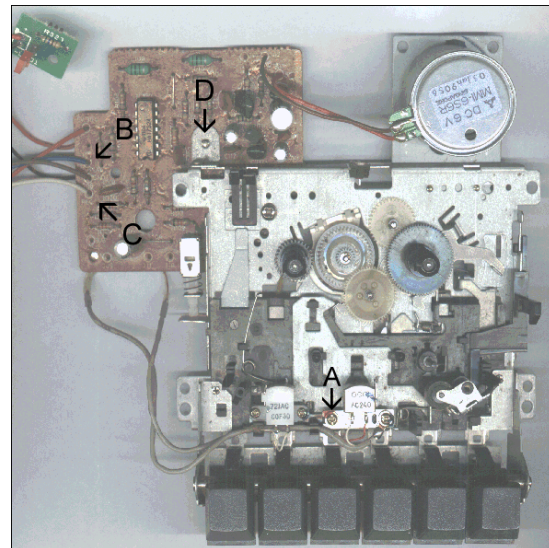
these ills (but a modified ROM might).

Common remedies

For genuine cassette player problems, there are things you can do to sort out the difficulties you are experiencing without having to resort to buying a new machine (most of you will interpret 'new' as second hand, but you can in fact still buy an actual new +2A from Sintech - see the ad on page 2). Of course the very first thing you should do is to get rid of all those oxide deposits that have built up over the years and give the tape head a good clean: apply head cleaning fluid (I'm told methylated spirits work also) using a cotton bud and make sure the head has dried properly (through evaporation) before testing. The older tapes get, the dirtier they get, so this could well sort your difficulties out by itself.

The next thing you can try is to adjust the head alignment screw. Shown at point A in the picture below, this little cross-headed screw becomes accessible through a small hole in the case (above the cassette player

controls - shown as point AA) when play has been pressed (ie, the head brought up to the tape) and allows the alignment of the head to the tape to be tweaked to it's 'azimuth' position (where the narrow slit in the head is at 90 degrees to the edge of the tape). You might need a good ear for this to work; the sound produced by the cassette player should become cleaner at the azimuth alignment. If you don't have a good ear, software has been written to help: *The Azimuth Head Alignment Kit* (Interceptor), for example and *Operation Caretaker* (Global), both of which send a stream of data through to the computer from the cassette deck, giving you feedback to inform your tweaking - the former can be downloaded from WOS (and recorded to tape from your PC using a utility such as **Taper**). Amstrad also built in an azimuth testing utility into their system diagnostic routine on the +3/+2A (to run this, you need to press and hold down the BREAK key whilst you reset the Spectrum, then - when the test card comes up - simultaneously press and hold down the keys



Know thy tape deck

- A - The 'azimuth' head alignment screw (accessible when a tape is playing through the hole labelled AA below)
- B - Blue - 'PLAY' (ear)
- C - White - 'REC' (mic)
- D - Earthing screw



Windows +3e

> New ROMs for the Spectrum +3e

Hot on the heels of version 1.04, version 1.10 of Garry Lancaster's +3e ROMs offers new streams and channels for you to play with using the **OPEN #** command, the most interesting of these being windows!

With a choice of 48 different character styles, justification, automatic scrolling and all the usual **INK** and **PAPER** type controls, Lancaster's windows offer a powerful way of displaying text output. They even overlap!

For more information on the +3e see the feature on page 18. Check out also www.z88forever.org.uk/zxplus3e/

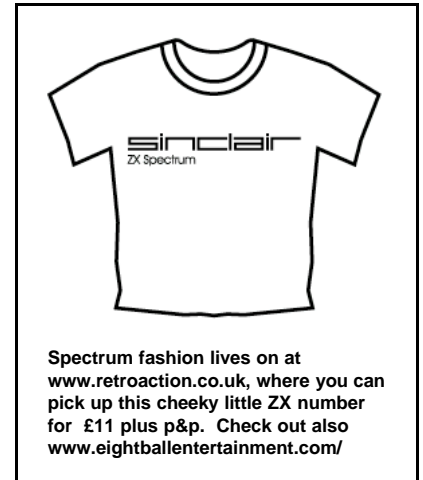
> Windows:
where does he get
his ideas from?



English succession

> German magazine hits UK

Suc-Session, the long running magazine of the Spectrum-User-Club in Germany, will now be sold in both German and English versions. Translated by Ian Spencer and Natalie Mayer, the January/February 2002 issue can be downloaded for free as a sampler from www.sintech-shop.de/home/spectrum-user-club.htm and features news, interviews, game tips and articles.



ebay in May

> Look at what you could have won

The computers themselves aside, what about this little lot for an ebay find in May:

- Sinclair Interface One & Microdrives
- Sinclair Interface 2
- Sinclair ZX81/Spectrum Printer and paper
- Rotronics Wafadrive
- Video Vault "Clive Drive"
- Datel Plus D Interface and disk drive
- dk'tronics 48k ZX Spectrum Lightpen
- Nidd Valley DigiMouse and software
- Cheetah SpecDrum
- Rombo VIDI-ZX Video Digitiser
- Prism VTX 5000 modem
- Kempston Pro JS Interface
- Sinclair Spectrum Light Gun

High prices this month:

- 48k Spectrum - boxed and unused - £166
- Boxed Spectrum 128 Heatsink - £104
- "ZX Spectrum Expansion System" £92
- Complete set of Ultimate games £122



Essential emulation

Just where should you GOTO for the very best in Spectrum emulation? Hardened emulator enthusiasts will probably know most of this off by heart, but to those of you just returning to the Spectrum scene (welcome, by the way; we've been expecting you), getting your head around the sheer wealth of emulators out there is a daunting task. Of course, covering *all* available emulators in complete detail would be beyond the scope of an entire issue, let alone a single page, but this little top four of mine should get you started. Don't forget, WOS lists just about every emulator for every platform there is (at www.worldofspectrum.org/emulators.html).

| Emulator | Version (updated) | OS | Spectrum models supported | Cassette interface? | Save to tape (TZX) | Save to disk (DSK) | Input recording | Mimick TV screen | Features |
|---|--------------------------|-----|------------------------------|---------------------|--------------------|--------------------|-----------------|------------------------|----------------------------------|
| RealSpectrum Ramssoft www.ramssoft.bbk.org | 0.94.22 (28/04/02) | DOS | All +3e Clones | No | Yes | Yes | Yes (AIR) | Yes | Wide range of hardware supported |
| ZX32 Vaggelis Kapartzianis www.geocities.com/SiliconValley/Bay/9932/ | 2.00.04.04 (05/04/02) | Win | All | No | No | No | No | Yes (full screen only) | Easy poke entering |
| Spectaculator Jonathan Needle www.spectaculator.com | 2.0 (11/04/02) | Win | 48k only | Yes | Yes | n/a | No | Yes | Game help system |
| SPIN Paul Dunn and Mark Woodmass http://homepage.ntlworld.com/paul.dunn4/SPIN.Zip | 0.2a (16/06/02) | Win | All +3e (no IDE support yet) | Yes | No | Yes | Yes (RZX) | Yes | Many planned |

ALSO: All emulators support the following formats: .SNA, .Z80, .TAP, .TZX. All emulators except Spectaculator support the +3 .DSK format. All have a go at multicolour effects. RealSpectrum and SPIN access their ROMs externally, allowing you to play with modifications.

Emulator news

SPECTACULAR SPECTACULATOR

Jonathan Needle's 48k Spectrum emulator *Spectaculator* has hit version 2.0, with new support for multi-channel sound and multicolour graphics. Also new to this version is support for TAP and TZX cassette file formats, managed via an innovative 'virtual cassette recorder'. *Spectaculator* comes with a small games pack featuring seven classic titles, including *The Hobbit* and the ubiquitous *Manic Miner*; the games come with their own help files in text or HTML format which can be accessed from the main *Spectaculator* help menu: at last we have an emulator capable of telling us which keys to hit! Creating a new help file for your own Speccy favourite is a simple matter of putting together a web page (or text file) and saving it in the same folder as the game file with the same name as the game itself. Clever. *Spectaculator* is one of the newest emulators about at present, but showing a great deal of promise. Find out more at <http://www.spectaculator.com/>

REAL DEVELOPMENTS

No sign of the much awaited Windows version as yet, but **Ramssoft's** mighty *RealSpectrum* 48/128k emulator made it to version 0.94.22 (beta 12) in April. By Ramssoft's own admission, this is a fairly uneventful update, but one which - in addition to numerous bug fixes and other tweakings - achieves perfect floating bus emulation for the first time. Clearly the Ramssoft staff are rather chuffed with themselves on this and have produced a technical report explaining it all at www.ramssoft.bbk.org/floatingbus.html.

SPINNING AROUND

SPIN (SPectrum INterpretor) is a new Spectrum emulator under development by

Paul Dunn (aka Dunny) and Mark Woodmass (aka Woody), and has just reached version 0.2a. Already acclaimed as one of the nicest looking Spectrum emulators, SPIN is developing at quite a speed, new versions being released practically every other week (by the time you read this I've no doubt several new versions will have been released since 0.2a), and is shaping up as an extremely competent emulator to rival the likes of *RealSpectrum*. Many users are in fact reporting it to have become their emulator of choice to replace **ZX32** (not updated since April 2000).

Once complete, SPIN will feature support for the new RZX recording format, allowing you to record your own key presses and thereby ensure that record-breaking game of *RoboCop* of yours is never forgotten. RZX is due to replace as the standard the AIR format previously employed for this purpose: due to the way in which timings were calculated, an AIR file could only be played back using the emulator software which created it (ie, a recording created on *RealSpectrum*, for example, could only be played on *RealSpectrum* and not on other emulators supporting AIR file recording); RZX files, however, are fully portable and can be replayed on any RZX supporting emulator.

Mark Woodmass is known for his own emulator, *SpecEmu*, which he will now no longer be developing (version 1.3 can still be download from www.geocities.com/specemu/, but is no longer supported). Meanwhile, SPIN itself can be downloaded from <http://homepage.ntlworld.com/paul.dunn4/SPIN.Zip>.

work, although I've found that some don't work; I can't explain why. The ones least likely to work seem to be Western Digital and Samsung makes, plus the Quantum Fireball range, and I try to maintain a list of those drives reported to work or not work. I've had all sorts of drives from 85Mb to 8Gb working.

You can get old hard drives from lots of suppliers; a good place to start is Micro Mart. There's no reason I know of that you couldn't put a new 20Gb to 80Gb drive on, but I've not tried that. One thing to bear in mind is that the capacity you get on the +3e will be half what it should be (eg 100Mb on a "200Mb" drive); this is because the interface is 8-bit, and the drives are 16-bit, so we basically throw away half the capacity. If you can fill even 100Mb with Speccy software though, you're a better man than me ;)

What about the components for the interface - I'm thinking of the edge connector in particular - these can't be easy to come by. Do you have source for these or is it a question of salvaging them from old spectrum hardware?

Maplins, Target and other electronics specialists can supply all the components except the edge connector. Yes, you could nick one off some old Spectrum hardware; alternatively, the electronics shops will sell PC edge connectors which you can just saw off to the correct size. If you build the internal interface, you don't need an edge connector at all, of course.

The hard disks themselves: are they easy to work with? Do you use the same commands as for the +3 floppy drive to manage files?

Before you can use the hard disk in normal BASIC commands, you have to format it (using a special new form of the FORMAT command) and then create one or more "partitions". Unlike under such backward systems as the PC where you have to run a special program and then reboot the system, doing this on the +3e is simply a matter of typing (at any time) something like:

NEW DATA "Games",16

to create a new partition called "Games" which is 16Mb in size. The maximum partition size is 16Mb (due to CP/M file system limitations) but you can have as many partitions as you like. There are also commands to delete and rename partitions, should you feel the need.

Once you have some partitions, you have to "map" them to a drive letter, like this:

MOVE "C:" IN "Games"

which makes drive C: refer to the "Games" partition. Now you can use drive C: in any +3 BASIC command, or in any program designed to use +3 files, just as you would with the standard drives A:, B: and M:. You can even make this the default drive with the standard LOAD "C:" command.

To avoid having to do this mapping every time you switch on the +3e, you can make it "permanent", so the +3e automatically does it for you when it starts. For example,

MOVE "D:" IN "Documents" ASN

Now, every time you turn on, drive D: is ready for use (and is shown in the copyright message). Other things you can make permanent are the default drive and colour scheme.

One further feature is that you can re-assign drives A:, B: and M: to other letters, so that drive A: could refer to the hard disk, and E: to the floppy drive etc, whatever you like. This can be useful with some programs that only look on the "A:" drive.

Can you create sub-directories or do the partitions serve that purpose for managing data?

No, you can't have subdirectories in CP/M file systems (which is what +3DOS uses).

How do you map partitions when you've run out of drive letters?!

You just have to "unmap" one partition with, eg,

Fist returns

> New remake in progress

Was there ever a correlation between the keys you pressed in **The Way of the exploding fist** and the subsequent movements of your karate fellow on the screen? Was there my a**e. But boy was that game fun. And now, Melbourne House's aussie classic is being remade by **sés** for us lucky PC users. So far only the first demo has been released, but it's enough to wet the appetite for sure. Soon you'll be able to duff up your mates the old fashioned way. Check it out at <http://ses.mgbr.net/>.



Changing fonts

> Spectrum typeface makeover

Not a new Windows Spectrum font - oh no. **Paul van der Laan's Clairsys** is a replacement for the good old Speccy typeface, never known - let's be honest here - for its elegance. The font has been built into new ROM files available from www.type-invaders.com/zxspectrum/ for use with an emulator (if you were really clever I suppose you could blow these onto EPROMs and use them with a real Speccy); there's also a .TAP file for emulators that don't separate out the ROMs from the main program code.

2002 Tour due soon

> ST2002 announced

The Speccy games tournament is back and will run from 16 September to 2 December this year. At the time of writing the specific games have yet to be decided, but Aleksandar Lukic (winner of ST2001), announcing the tour in **comp.sys.sinclair**, has expressed a preference this year for a shift towards "genuine Speccy games" rather than coin-op conversions. The new tour will not this year be overseen by Michael Bruhn, who ran both the 2000 and 2001 predecessors.

With RZX still under development, no decisions have yet been made as to how game performances will be recorded (and submitted); the current consensus appears to be to wait until a week before the tour begins and see what's available then. Last year saw the use of the AIR format for the first time, however due to AIR's portability problems this meant all entrants had to use the **Real Spectrum** emulator to ensure compatibility.

"Open your eyes"

"Oh... wow... it's so... different... I love the n... oh look - they kept the a..."

Sinclair < old

Sinclair < new



Hard Drive

The evolution of the ZX Spectrum isn't over yet. Emulators are great, but they're just not the same as the feel of real Spectrum hardware quivering beneath your fingertips... sort of. If you're one of those born again few who want to go back to the unemulatable aesthetics of a genuine Speccy, but can't face the prospect of learning the art of chuntney balancing all over again, you just might be in luck. Garry Lancaster has taken Amstrad's Sinclair swansong to a whole new plane altogether. Prepare yourself for a Spectrum hard disk, and more...

What is the Spectrum +3e?

Basically, it's a combination of software and hardware (new ROMs and a hard disk interface) for the Spectrum +3 (or black +2A) which enhance it in various ways, by fixing bugs, and adding new features and commands. The ability to use hard disks on your Speccy is the most obvious new improvement, but it's not necessary to actually build an interface - the +3e ROMs have many useful extras that don't require hard disks at all.

ROMs? How do I get/fit new ROMs?

There's three ways to get the ROMs. First, if you are able to blow your own EPROMs, you can just download the latest version from the +3e website and do that. Or, you can send me 2 x 32K EPROMs (the required type is 27C256) and return postage and I'll do it for you. Finally, if you can't get hold of EPROMs yourself, I'll provide them complete with the latest version of the +3e ROMs for £10.

The website also contains a ROM file that can be used with the RealSpectrum emulator, which emulates the +3e complete with hard disk interface.

So where can I get EPROMs from? When I asked in Dixons they looked at me kind of funny...

Specialist electronics shops can supply them (Maplins, Target etc) but forget Tandy, as they stopped dealing in anything like that ages ago. A cheaper place to get them is out of old PCs - any largish chip on a motherboard/video card etc with a label on it is a likely suspect; just look for the magic 27256 numbers (probably liberally interspersed with other characters to keep you on your toes).

And the old Spectrum ROMs are easy to remove?

Yes, they come out quite easily if you slide a small flat-bladed screwdriver between the chip and the socket; you just need to be a little bit careful to avoid bending the pins.

Ok - so what sort of extras do the +3e ROMs feature by themselves?

For starters, a lot of the bugs in the original +3 ROMs have been fixed; particularly the CAT command (which doesn't cope well with large disks on the +3) and lots of bugs in the 128K editor. There are some extra commands that let you easily change the colours in the editor as well (SPECTRUM PAPER etc) so you're not stuck with black-on-white.

Snapshot loading has been added recently, so if you copy a .z80-type snapshot onto a

Sabre Wulf (PC)

Authors: Kieran and Declan Sandwell

Download it from: www.dexfx.pwp.blueyonder.co.uk/ss/

Down and down I plunged, through Rocky Glades, Steep Ravines and Shady Hollows...No grip, no footholds, slipping, tumbling, spinning, darker and darker, deeper and deeper...

Sabre Wulf, you have a special place in my memories. Officially the first 48k Spectrum game I ever saw, I remember to this day being blown away by the amount of colour Ultimate had managed to pack onto the screen, and by the number of screens there were too. But quite apart from these technical accomplishments, there was an aesthetic appeal that I've rarely found in games since: Sabre Wulf had atmosphere.

I don't think I'm alone in this feeling, looking at the Sandwell brothers' Blitz Basic remake of the game Ultimate released to a public they considered 'not ready' for its sequel (Underworld). The moody jungle soundtrack of bird and insect symphony tunes into this atmosphere perfectly; loading up the game for the first time and listening to it I immediately felt that this bit was right.

Kieran and Declan have done a thoughtful job at updating the graphics to this title, choosing to keep the various sprites (jungle beasts you are required to shake your pointy stick at, the 'power changing' orchids and - of course - Sabreman himself), plants, caves and mountains in pretty much their original forms and colours, tweaking them very subtly to add depth to the action. The main sound effects have been preserved without alteration. Perhaps the most significant change is that remake expands the original viewing area by shrinking everything down in size so that you can now see much further ahead than you could before.

It's great to see remakes coming from new places - long may this continue, say I - as software such as Blitz Basic gives programming access to a wider population of aspiring authors. This is a good remake of a classic title that brings back many happy memories as I play it. For me, personally,

the graphics are a little to sharp to capture fully the visual atmosphere that the original created, and enlarging the viewing area has made the jungle feel less overwhelming, and appear more orderly and structured than one feels a jungle perhaps should. But these are minor gripes. Come on - it's Sabre Wulf; what more do I need to say?



The Spectrum original and the remake.



VERDICT

| | |
|----------------|----------|
| Graphics | 7 |
| Sound | 9 |
| Playability | 7 |
| Addictiveness | 7 |
| Overall | 7 |

List

```

9624 DATA 8,5,4,17,4,20,4,11,8,10
9626 DATA
    4,5,8,8,4,5,4,7,4,5,4,7,4,8,4,
    7
9630 DATA
    8,0,4,12,4,15,4,6,8,5,4,12
9632 DATA
    8,0,4,12,4,15,4,6,8,5,4,12
9634 DATA 8,0,4,12,4,15,4,6,8,5
9636 DATA
    4,0,8,3,4,0,4,2,4,0,4,2,4,3,4,
    2
9640 DATA
    4,0,4,0,4,0,4,0,4,0,4,0,8,10
9642 DATA
    4,0,4,0,4,0,4,0,4,0,4,0,8,9
9644 DATA
    4,0,4,0,4,0,4,0,4,0,4,0,4,8
9646 DATA
    8,3,4,0,4,2,4,0,4,2,4,3,4,2
9650 DATA
    4,0,4,0,4,0,4,0,4,0,4,0,8,10
9652 DATA
    4,0,4,0,4,0,4,0,4,0,4,0,8,9
9654 DATA
    4,0,4,0,4,0,4,0,4,0,4,0,4,8
9656 DATA
    8,3,5,0,6,2,6,0,6,2,8,3,16,2,
    22,0,180,-12,

#
# Initialize UDG's
#
9700 RESTORE 9740
9705 FOR N=USR "a" TO USR "p"+7
9710 READ x: POKE N,x
9715 NEXT N
9720 RETURN
# A - Block
9740 DATA
    250,192,128,128,128,0,128,0
# B - Top left corner
9742 DATA 0,7,31,63,127,255,255,255
# C - Top right corner
9744 DATA
    0,224,248,252,254,255,255,255
# D - Bottom left corner
9746 DATA 255,255,255,127,63,31,7,0
# E - Bottom right corner
9748 DATA
    255,255,255,254,252,248,224,0
# F - Top rounded piece
9750 DATA
    24,126,255,255,255,255,255,25
    5
# G - Left arrow <-
9752 DATA 16,48,126,254,126,48,16,0
# H - Right arrow ->
9754 DATA 16,24,252,254,252,24,16,0
# I - Rotate symbol @
9756 DATA
    121,255,231,207,192,194,246,12
    4
# J - Down arrow \
9758 DATA 56,56,56,254,124,56,16,0
# K - Letter O
9760 DATA
    124,254,198,198,198,254,124,0
# L - Letter P
9762 DATA
    252,254,198,254,252,192,192,0
# M - Letter Q
9764 DATA
    124,254,198,198,206,255,127,0
# N - Letter A
9766 DATA
    124,254,198,254,254,198,198,0
# O - All the l's (just for
    convenience rather than using
    spaces)
9768 DATA
    255,255,255,255,255,255,255,25
    5
# P - "<" Character using on front
    screen
9770 DATA
    254,248,240,128,128,240,248,25
    4

#
# Print number of Lines achieved
#
9800 PRINT AT 4,24;"00000"
9805 IF Lines>9999 THEN PRINT AT
    4,24;Lines: RETURN
9810 IF Lines>999 THEN PRINT AT
    4,25;Lines: RETURN
9815 IF Lines>99 THEN PRINT AT
    4,26;Lines: RETURN
9820 IF Lines>9 THEN PRINT AT
    4,27;Lines: RETURN
9825 PRINT AT 4,28;Lines
9830 RETURN

```

```

n3=p3+32: LET n4=p4+32
3020 IF n1<>p2 AND n1<>p3 AND n1<>p4
    AND PEEK(22528+n1) <> 0 THEN LET
    IsBottom=-1: RETURN
3030 IF n2<>p1 AND n2<>p3 AND n2<>p4
    AND PEEK(22528+n2) <> 0 THEN LET
    IsBottom=-1: RETURN
3040 IF n3<>p1 AND n3<>p2 AND n3<>p4
    AND PEEK(22528+n3) <> 0 THEN LET
    IsBottom=-1: RETURN
3050 IF n4<>p1 AND n4<>p2 AND n4<>p3
    AND PEEK(22528+n4) <> 0 THEN LET
    IsBottom=-1: RETURN
3060 RETURN

#
# Read Keys + action them
#
3105 IF IN 57342=254 THEN GOTO 3200
3110 IF IN 57342=253 THEN GOTO 3300
3115 IF IN 64510=254 THEN GOTO 3400
3120 IF IN 65022=254 THEN GOTO 3500
3125 RETURN

### Move Right ###
3200 LET low=0
3202 IF b(1,1) > low THEN LET
    low=b(1,1)
3204 IF b(2,1) > low THEN LET
    low=b(2,1)
3206 IF b(3,1) > low THEN LET
    low=b(3,1)
3208 IF b(4,1) > low THEN LET
    low=b(4,1)
3210 IF b(1,1)=low AND PEEK
    (22528+x+b(1,1)+1+((y+b(1,2))
    *32)) <> 0 THEN RETURN
3212 IF b(2,1)=low AND PEEK
    (22528+x+b(2,1)+1+((y+b(2,2))
    *32)) <> 0 THEN RETURN
3214 IF b(3,1)=low AND PEEK
    (22528+x+b(3,1)+1+((y+b(3,2))
    *32)) <> 0 THEN RETURN
3216 IF b(4,1)=low AND PEEK
    (22528+x+b(4,1)+1+((y+b(4,2))
    *32)) <> 0 THEN RETURN
3220 LET newx=x+1
3230 RETURN

### Move Left ###
3300 LET low=3
3302 IF b(1,1) < low THEN LET
    low=b(1,1)
3304 IF b(2,1) < low THEN LET
    low=b(2,1)
3306 IF b(3,1) < low THEN LET
    low=b(3,1)
3308 IF b(4,1) < low THEN LET
    low=b(4,1)

3310 IF b(1,1)=low AND PEEK
    (22528+x+b(1,1)-1+((y+b(1,2))
    *32)) <> 0 THEN RETURN
3312 IF b(2,1)=low AND PEEK
    (22528+x+b(2,1)-1+((y+b(2,2))
    *32)) <> 0 THEN RETURN
3314 IF b(3,1)=low AND PEEK
    (22528+x+b(3,1)-1+((y+b(3,2))
    *32)) <> 0 THEN RETURN
3316 IF b(4,1)=low AND PEEK
    (22528+x+b(4,1)-1+((y+b(4,2))
    *32)) <> 0 THEN RETURN
3320 LET newx=x-1
3330 RETURN

### Rotate ###
3400 LET Rot=Rot+1: IF Rot=4 THEN LET
    Rot=0
3405 GOSUB 3850
3410 GOSUB 3900 + Piece * 100 + Rot *
    10
3412 LET Low=11
3414 IF x+b(1,1) < Low THEN LET Low =
    x+b(1,1)
3416 IF x+b(2,1) < Low THEN LET Low =
    x+b(2,1)
3418 IF x+b(3,1) < Low THEN LET Low =
    x+b(3,1)
3420 IF x+b(4,1) < Low THEN LET Low =
    x+b(4,1)
3422 IF Low < 11 THEN LET x=11: LET
    newx=11: GOSUB 3800: RETURN
3424 LET Low=20
3426 IF x+b(1,1) > Low THEN LET Low =
    x+b(1,1)
3428 IF x+b(2,1) > Low THEN LET Low =
    x+b(2,1)
3430 IF x+b(3,1) > Low THEN LET Low =
    x+b(3,1)
3432 IF x+b(4,1) > Low THEN LET Low =
    x+b(4,1)
3434 IF Low > 20 THEN LET x=x+20-Low:
    LET newx=x
3436 GOSUB 3800
3440 RETURN

### Drop ###
3500 GOSUB 3850
3510 GOSUB 3000
3520 IF IsBottom THEN GOSUB 3800:
    RETURN
3530 LET y=y+1
3540 GOTO 3510

#
# Draw Piece
#
3800 POKE 22528+x+b(1,1)+((y+b(1,2))
    *32),71+Piece*8

```